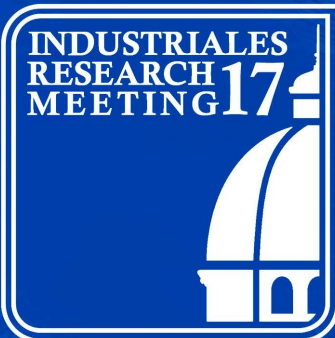




```
<!-- Add the differential drive controller bw -->
<gazebo>
  <plugin name="DifferentialDrive" filename="libdifferential_drive.so">
    <rosDebugLevel>warn</rosDebugLevel>
    <publishWheelSeparation>false</publishWheelSeparation>
    <alwaysOn>true</alwaysOn>
    <frontWheelJointName>front_wheel_joint</frontWheelJointName>
    <rearWheelJointName>rear_wheel_joint</rearWheelJointName>
    <createIgnition>0.13414141414141414</createIgnition>
    <wheelSeparation>0.569</wheelSeparation>
    <wheelDiameter>0.25</wheelDiameter>
    <wheelTorque>20</wheelTorque>
    <wheelAcceleration>1.8</wheelAcceleration>
    <command>cmd_vel</command>
    <robotBaseName>/robot_base</robotBaseName>
    <robotBaseRate>1000</robotBaseRate>
  </plugin>
</gazebo>
```



Industriales Research Meeting

Escuela Técnica Superior de Ingenieros Industriales
Universidad Politécnica de Madrid
April 4 - 5, 2017

© Universidad Politécnica de Madrid
Escuela Técnica Superior de Ingenieros Industriales
Subdirección de Investigación, Doctorado y Relaciones con Empresas
C/José Gutiérrez Abascal 2
28006 Madrid

ISBN: 978-84-16397-58-7

CONTENS

Foreword of the Director	4
Organizing Committee	5
Technical program of IRM17	
Conference at a glance	6
Research works and patents	8
Research Groups, Centers and Institutes	18
Companies at IRM17	20
Closing ceremony & awards	22
Posters of research works	
Acoustics Engineering	23
Aerospace	27
Automation	31
Bioengineering & Health	42
Chemical Engineering	50
Electronics	56
Electrical Engineering & Machines	69
Energy	72
Environmental Engineering	80
Laser Technology	84
Materials	90
Management and Industrial Organization	100
Mechanics, Manufacturing & Structures	119
Mathematics & Statistics	131
Nuclear Technology	134
Seismic Engineering	140
Vehicles & Railways	144
Posters of patents	154
UPM Institutional posters	178
Posters of Research Groups, Centers and Institutes	183

Abstract

Let's imagine a fire control mission performed by multiple robots and commanded by a single operator. This scenario poses two challenges related to human factors: workload - the operator has to receive data, discover information, make decisions and send commands - and situational awareness - he/she has to know what is happening at any time of the mission. This work aims for the selection of the information that is shown by the interface to the operator. This information should be outlined according to the mission's state and evolution together with the operator class, state and preferences. The expected result is an intelligent adaptive interface that provides the most relevant information for each task.

Chapter 1: A game of drones

Multi-robot missions generate a huge amount of data.

Motor, Speed, Actuator, Current, Longitude, Command, Waypoint, Humidity, Telemetry, Fuel, Voltage, Target, Distance, Payload, Camera, Mode, Temperature, Roll, Acceleration, Yaw, Orientation, Pitch, Resource, Latitude, Battery, Altitude, Position, Robot, Sensor, Tank

This fact may cause human factor problems...

Workload

Situational awareness

Chapter 2: Deconstructing mission

Data

1 The data from previous missions is collected by event logs.

Case	Activity	Time	Resource
M1	Surveillance	1:10	UAV 1
M1	Reconnaissance	1:13	UAV 2
M1	Capture	1:17	UAV 1

2 The models are automatically generated from the event logs with process mining.

3 Petri nets are used to define the mission state and decision trees predict its evolution.

4 The models are applied to discover relevant information according to the situation.

Information

Robot 1:
- Distance to base.
Robot 2:
- Battery.
- Altitude.
Robot 3:
- Camera.
Robot 4:
- Temperature.
- Water tank.

Chapter 3: There's something about Operator

Now the information is adapted to the mission, but what about the operator?

Data mining allows to discover patterns and classify operators...

Operator	#1
Class	Professional
Stress	High

Operator	#12
Class	Training
Stress	Low

... and machine learning can be used to find their preferences.

- Reduce amount of information.
- Select preferred variables.
- Information useful for training.
- Activate decision support.

Chapter 4: The lord of the UAVs

The result is an intelligent adaptive interface that helps the operator.

Priority

- UAV 3
- UAV 1
- UAV 2
- UAV 4

Map

UAV 3

Task: Surveillance
Progress: 95%
Targets: 0

UAV 1

Task: Tracking
Target: V1
Distance: 2,000m

Events

- UAV 3 battery is low.
- UAV 1 is finishing surveillance.
- UAV 2 is landing.
- ...

One moment... Why not try something else?

Immersive interface with virtual / augmented reality.